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P. Caron, E. Valette,
T. Wassenaar,
G. Coppens d'Eeckenbrugge,
V. Papazian,
Coordinators

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Patrick Caron, Élodie Valette, Tom Wassenaar,
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Cirad
42 rue Scheffer, 75116 Paris
www.cirad.fr

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Agence française de développement
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www.afd.fr

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Chapter 9

Dissemination of improved crop varieties in Africa: how territorial partnerships ensure the success of innovations

Danièle Clavel, Gilles Trouche, Louis-Marie Raboin and Kristen vom Brocke

The level of adoption of improved food crop varieties remains low in sub-Saharan Africa (Yapi *et al.*, 2000), a situation that must be viewed in the light of existing seed production and exchange systems. These informal but dominant systems are diverse and resilient (McGuire and Sperling, 2013), and concern improved, traditional and even local varieties. This situation is a result of multiple factors and varies according to contexts (countries, regions and species involved, actors, policies, etc.). Some leading causes include the poor suitability of proposed improved varieties to cropping systems and the needs of smallholders; the lack of smallholder knowledge about these new varieties; and the poor implementation of centralized State schemes for the production of so-called certified seeds (Louwaars and de Bœuf, 2012; Clavel, 2016). Informal rural systems for the selection, production and exchange of varieties and seeds are increasingly being overlooked. However, some programmes of varietal development and/or production and of dissemination of seeds of improved varieties, conducted in close partnership with farmer organizations or groups, and deeply rooted in the territories concerned, show that it is possible to increase the rate of adoption of improved varieties considerably.

In this chapter, we analyze the conditions that are conducive to varietal innovation from three case studies. Three varietal improvement programmes – groundnut in Senegal, upland rainfed rice in Madagascar, and sorghum in Burkina Faso – were conducted by plant breeders and agronomists with a significant involvement of farmers and other development actors. An *ex post* evaluation was carried out within the framework of CIRAD's 'Impact of Research in the South' programme (Impress, http://impress-impact-recherche.cirad.fr/), based on a participatory approach that included surveys of key actors and beneficiaries. These studies are characterized by their observation over the long term of the development of varietal and seed innovations: since 1984 for rice (Raboin *et al.*, 2013, 2014), 1999 for groundnuts (Clavel *et al.*, 2013) and 1995 for sorghum (vom Brocke *et al.*, 2010).

The research and development activities evaluated took place in contexts that were always evolving and which were marked by irregular funding and discontinuous human resources. Researchers involved in these studies are plant breeders embedded in territories they know well in terms of ecogeography and actors. Although ascertaining the social impact was not an explicit goal, impact assessments as part of the studies identified the major drivers of the success of innovations and explained the role that research played in the changes (Table 9.1).

How have territorial links contributed to the impact?

The role of the research community has proven to be decisive through the creation and maintenance of a solid institutional and territorial partnership, and through training activities it has organized. Peer-to-peer exchanges between farmers have played an important role in all three cases in the dissemination of varieties, the acquisition of technical skills, and in the organization of seed production. In the case of groundnuts, the model of the local seed cooperative has been replicated in other regions and has subsequently encompassed other food crop speculations such as millet, sorghum and maize. In the case of rice, geographical proximity was crucial as the numerous trials conducted in rural areas and the demonstrations conducted increased opportunities for dialogue and learning. The development of individual, collective and institutional skills was probably the main factor that allowed a real structuring of the seed sector taking into account the needs and expectations of sorghum farmers in Burkina Faso.

Research and training activities, by virtue of being anchored to a territory, participated in its construction. Indeed, they brought together various actors in common spaces. Furthermore, because they are inherited and passed on, seeds possess a heritage value and, in this way, contribute strongly to a territory's identity (Labeyrie *et al.*, 2014). It is therefore not surprising that actors of a given territory willingly invest themselves in varietal innovations.

Partnerships in agricultural development projects often have a limited lifetime, as public funding mechanisms do not ensure seamless funding from one period to the next, resulting in discontinuities and bottlenecks. The acquisition of new capacities by farmers and their collectives (experimentation with and evaluation of varieties, production of quality seeds, collective organization) and the creation of partnerships with the research community over the long term help compensate, at least partially, for any shortfalls in funding and/or the departure of any particular actor in the course of the innovation's development. Experience has shown that if a new variety meets the expectations of producers, informal farmer-to-farmer dissemination always occurs, and the role of the research community becomes gradually less obvious. Varieties disseminate better when the actors' innovation capacities can help them form partnerships that are essential to a greater impact. The observed up- and out-scaling have taken different forms, but we consider that the success of the innovations depend on the identification of actor-partners and the facilitation of their interconnection in such a way they will able to participate from the initial phases of the project and in its deployment. This is, indeed, a major challenge for the research community, one that can be largely addressed by leveraging territorial links.

Table 9.1. Main results of the impact assessments in the three case studies.

Case study	Groundnut in Senegal	Rice in Madagascar	Sorghum in Burkina Faso
Context	Groundnut is both the main income source and forage plant. Its usefulness as food is growing. The structural adjustments of the 1980s liberalized the sector and, in 2002, led to the dismantling of State-owned enterprises Sonacos and Sonagraines, thus disrupting seed collection, marketing and production.	The highlands are densely populated with limited possibilities for infrastructure for irrigated rice fields. Land pressure is high and food security remains uncertain. It is not possible to grow rainfed upland rice due to the lack of suitable varieties adapted to altitudes greater than 1300 m.	Sorghum is the staple food of rural populations, especially in the driest areas (annual precipitation < 800 mm). While varietal improvement programmes were launched in the 1960s, the adoption rates of varieties and the availability and use of improved seeds remains low.– There is a need to increase yields and regularity of production.
Research objective and description of the innovation	Interpreting the new varietal map (area-wise distribution of improved varieties) in terms of the organization of seed production without State support. Design of a cooperative model for the production of quality seeds and groundnuts (without aflatoxins).	Creating new varieties for upland rainfed rice cultivation (since 1984). Improving self-sufficiency in rice for highland smallholders. Varieties are created by cross-breeding and selection in high-altitude experimental stations using low-input cultivation systems.	Developing high-yielding varieties through participatory breeding (PB) in rural farming systems that are adapted to the use of grains and straw in two agro-climatic zones of the country (West and Centre-North). Seven new varieties were created and new methods of seed dissemination were developed.
Building of the partnership	Research community + producer organization + local committee for coordination of farmer organizations active in Paoskoto village. Coordination for setting up partnerships involving donors (EU and WB) from the start. Research community and producer organizations act as brokers to facilitate partnerships with entities outside the initial core group (certification agencies, banks, private seetor).	A large number of trials were undertaken in farmers' fields with different partners (farmer organizations, development projects, NGOs and research and education institutions) to evaluate varieties in a participatory manner. Peer-to-peer distribution from the various trial locations.	Innovation development phase: research community + region-wise producer organizations + network of farmer-breeders. Innovation dissemination phase: research community + same producer organizations + networks of seed producing farmers and other public and private development actors.
Training and capacity development	Decentralized collective training with respect to the development of the model cooperative and quality production. Professionalization training (production techniques, management, marketing).	Trainings of technicians of partner organizations through trials in farmers' fields. Training of farmers through exchange visits, open houses, extension documents with or without the support of the research community by partners.	Training on varietal testing in smallholder farms, participatory breeding methods, production, packaging and marketing of seed, initially designed and implemented by the research community, then adapted by producer organizations.
Factors contributing to the perpetuation and extension of the innovation	Setting up in the territory of the model cooperative and subsequently of 28 other cooperatives. Increased capacity of producer organizations to defend the interests of the groundnut sector, in particular by mobilizing fresh funding. Extension of the certified-seed cooperative model to other species and to other African countries.	Strong demand for rice and the opportunity for growing rainfed upland rice seized by researchers and farmers. Establishment of local farmer networks for varietal assessment. – Continued presence of the research community since 1984 and a long-term and ongoing partnership with development companies established in the region for the production of certified seeds.	Continuity of several research projects in the same territories and with the same actors over a period of 15 years. Willingness of researchers to support producer organizations even up to the stages downstream of varietal creation. Improved recognition by the two producer organizations of the links existing between agricultural production and development of their territories. Actions by public entities favourable to dissemination of improved varieties.

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